

Blake (Wm P.)

ANNOTATED CATALOGUE

OF THE

PRINCIPAL MINERAL SPECIES

HITHERTO RECOGNIZED IN

CALIFORNIA,

AND THE

ADJOINING STATES AND TERRITORIES;

BEING A

Report to the California State Board of Agriculture,

✓  
BY WILLIAM P. BLAKE,

GEOLOGIST OF THE CALIFORNIA STATE BOARD OF AGRICULTURE; AND PROFESSOR OF MINERAL-  
OGY, GEOLOGY, AND MINING, IN THE DEPARTMENT OF SCIENCE OF  
THE COLLEGE OF CALIFORNIA.

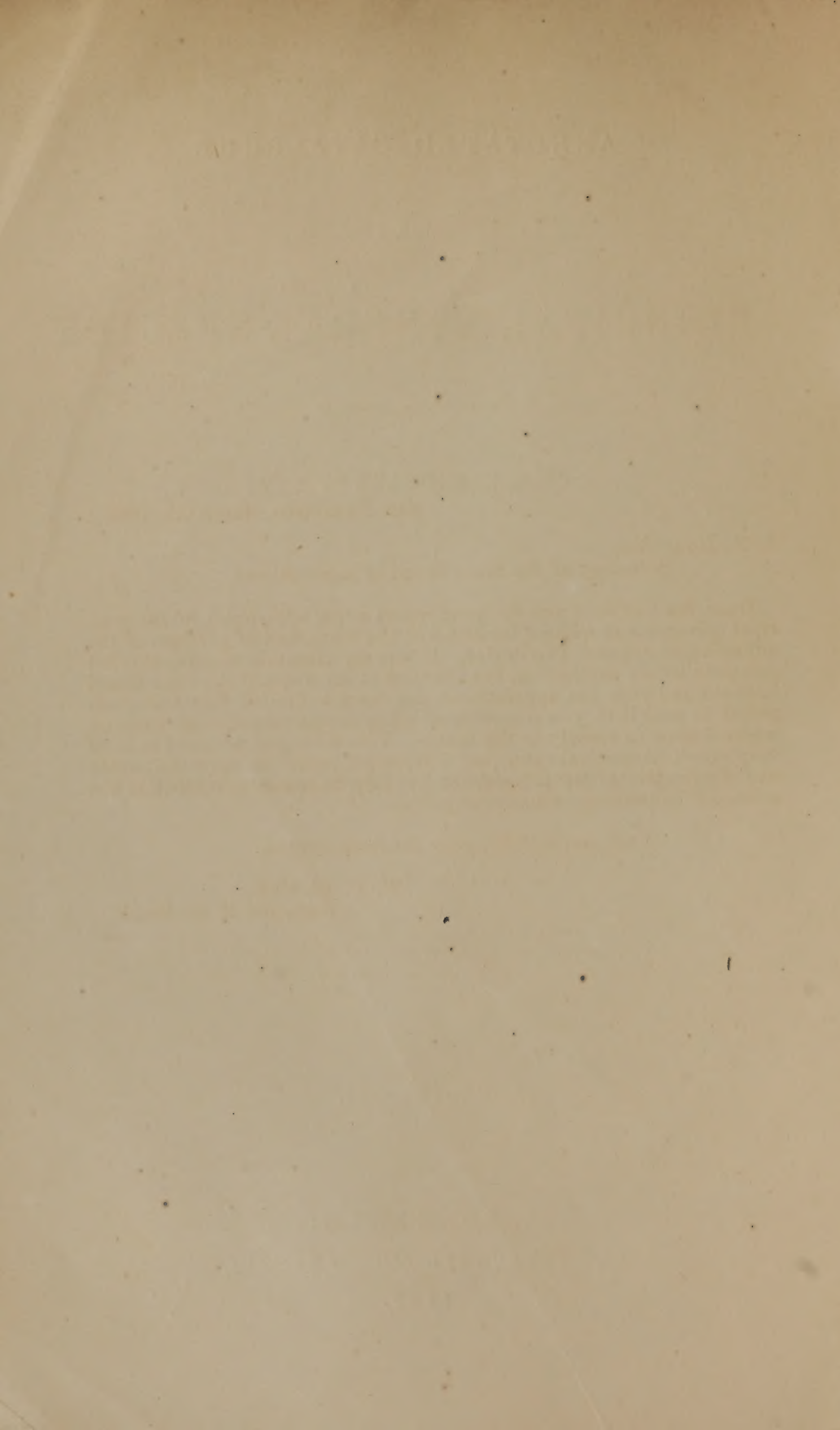
MARCH, 1866.

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1866.



SAN FRANCISCO, March 6th, 1866.

I. N. HOAG, Esq.,  
Secretary of the State Board of Agriculture:

DEAR SIR:—I send you for your report a list, with notes, of the principal minerals and mineral localities of the State, and of portions of the adjoining States and Territories. It was my intention to make this list complete before publication, but the time at my disposal since the Board honored me with the appointment has been so limited that I am compelled to send it to you conscious of many omissions and imperfections, which I hope to remedy in the future. This list is not designed to be of very direct economical value, but is intended rather to show the nature and distribution of our minerals, and to help to arouse an interest in the science of mineralogy among our people.

Very respectfully, your obedient servant,

W. P. BLAKE,  
Geologist of the Board.





AUTHORS AND PUBLICATIONS

UPON THE

MINERALOGY OF CALIFORNIA.

---

ANTISELL, THOMAS. U. S. Pacific Railroad Reports; vol. 6.

BLAKE, WILLIAM P. Report upon the Geology and Mineralogy of the silver region of the Territory of Nevada, or "Washoe." 1861. (Addressed to the Governor of the Territory.) Inedited.

——— Memoir on the Geology of the Coast of California. United States Coast Survey Report for 1855.

——— Observations on the extent of the gold region of California and Oregon, with notices of mineral localities in California, and of some remarkable specimens of crystalline gold. *American Journal Science*, vol. 20, page 72; 1855.

——— Report of a Geological Reconnoissance in California, etc. 4to. New York; H. Bailliére. Also, in vol. 5 U. S. Pacific Railroad Reports.

——— Silver Ores, and Silver Mines. 8vo. New Haven, 1861.

——— Report upon the minerals and mineral products of the Mechanics' Fair Exhibition, California. *Mining and Scientific Press*, October, 1864; vol. 10, page 264.

DANA, PROFESSOR JAMES D. Report on the Geology of the United States Exploring Expedition. 4to. Washington.

——— Manual of Mineralogy.

——— System of Mineralogy.

- FREMONT, COLONEL J. C. Geographical Memoir upon Upper California, etc. Washington, 1848.
- HUMBOLDT, ALEXANDER. Nouvelle Espagne.
- ISBISTER, A. K. Geological sketch of the northernmost parts of America, etc. *Quarterly Journal Geological Society*, London; vol. 11, page 497; 1855.
- MARCOU, JULES. Geology of North America. 4to. Zurich, 1858. See, also, a "Resumé" in the reports of the U. S. Pacific Railroad Surveys.
- Sur le Gisement de l'Or en Californie. 8vo. pamphlet. Geneva, 1855.
- MINING MAGAZINE. 12 vols. 8vo. New York. Second series, vols. 1 and 2. New York and New Haven.
- MINING AND SCIENTIFIC PRESS. 4to. San Francisco.
- MOFRAS, DUFLOT DE. Explorations du Territoire de l'Oregon, des Californies et de la Mer Vermeille, 2 vols. 8vo. Paris.
- NEWBERRY, DR. J. S. Pacific Railroad Reports, and Ives' Colorado Expedition Report.
- PACIFIC RAILROAD EXPLORATIONS AND SURVEYS. 12 vols. 4to. Government Press, Washington; various years, from 1855 to 1861.
- PUMPELLE, RAPHAEL. Mineralogical sketch of the Silver Mines of Arizona. *Proceedings California Academy Natural Sciences*, vol. 2, page 127.
- RANDALL, A. Report in favor of a Geological Survey of California, submitted in Assembly April 24, 1851. 19 pages, 8vo.
- RICHTHOFEN, FERDINAND BARON. Die Metall-Produktion Californiens und der Angrenzenden Länder. 4to. Gotha; Justus Perthes, 1864. Also, in *Petermann's Mittheilungen*.
- TRASK, JOHN B. Reports on the Geology of California, to the Governor and Legislature of the State, from 1853 to 1856. 8vo. State documents; Sacramento.
- TYSON, PHILIP T. Geology and Industrial Resources of California. 8vo. Baltimore, 1851. Also, as Ex. Doc. No. 47, 31st Cong., 1st sess.; Senate.
- WHITNEY, PROFESSOR J. D. Geological Survey of California, vol. 1, 1866.
- WILSON, J. S. On the Gold Regions of California. (Extract from the *Quarterly Journal of the Geological Society*, London; vol. 10.)

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ACTINOLITE.

Occurs with garnets in steatite at Petaluma.

ALABASTER.

In *Los Angeles County*. Specimen in cabinet of the author, received from Mr. Tyson, of Arizona.

ANDALUSITE.

*Mariposa County*.—In the drift of the Chowchillas River, near the old road to Fort Miller, there is a great abundance of fine crystals of andalusite which show the dark lines or crosses in a remarkably perfect and interesting manner. They are found also in the stratum of conglomerate which caps the hills along the stream, and are doubtless in place in the slates a little higher up the river.

Smaller and less perfect "macles" occur in the slates at Hornitos, on the road to Bear Valley. Some of the specimens from the Chowchillas River resemble those from Lancaster, Massachusetts.

ANTIMONY—(*Sulphuret of.*)

(SEE STIBNITE.)

ANTIMONY OCHRE.

*San Amélio Mountain*, with antimony-glance.



## AGATES AND CARNELIAN.

Beautiful pebbles of agate and carnelian are abundant along the beach at and near Crescent City. They are much water-worn, and are generally of light colors. Larger pebbles and more highly colored are abundant in the pebbly drift along the Colorado River. Small but very smoothly worn specimens of agate and jasper may be picked up on the shores of Lake Tahoe.

## ARSENIC.

*Monterey County*, at the Alisal mines, twenty-five miles from the Mission of San Carlos.

## ARSENICAL-ANTIMONY.

Ophir Mine, *Nevada Territory*.—In reniform, finely crystalline, somewhat radiated masses, of a color between tin white and iron black, on a fresh fracture, but greyish black from tarnishing; associated with arsenolite, calcite, and quartz.—(*F. A. Genth, Am. Jour. Sci.*, (2) xxxiii, 190.)

## ARSENOLITE.

Occurs in large masses, with native gold, at the Armagosa Mine, Great Basin. It is also reported from the Ophir Mine with arsenical antimony.—(*Genth*.)

## ASBESTUS.

*Calaveras County*, Salt Spring Valley, at the Kentucky claim. *Los Angeles County* (?) in large masses. (From Major Stroebel.)

AZURITE—(*Blue Carbonate of Copper*.)

In fine crystalline groups and masses, with malachite, at Hughes' Mine, *Calaveras County*. (1861.)

## BIOTITE.

From the vicinity of Grass Valley. (Cabinet of C. W. Smith.)

## BITUMEN.

Occurs abundantly in numerous places in the Coast Mountains, south of San Francisco, but especially south of San Luis Obispo, and in the vicinity of Los Angeles. It is frequently seen floating in the Santa Barbara channel. It is abundant in *Tulare County*, on the west side of the Tulare Valley, near Buena Vista and Kern Lakes, and at this and other localities is associated with *petroleum*, (which see.)

## BLENDE.

Occurs sparingly in many of the gold bearing quartz veins of the State, especially when lead is present, as, for example, at the Princeton Mine, Mariposa estate; the Adelaide Mine, Hayward & Chamberlain's Mine, and in several of the Grass Valley mines in *Nevada County*; at Meadow Lake, in considerable masses, with galena, iron pyrites, and



copper pyrites. It is associated with yellow copper in the Napoleon Mine and the Llancha Plana; in *Sacramento County*, at Michigan Bar, associated with galena, oxide of iron, and copper ore. (Cabinet of Dr. Frey.) *Placer County*, fifteen miles from Lincoln, towards Nevada, with galena and gold; at the Bloom claim, near Angels' Camp, *Calaveras County*; also in a quartz vein in Coulterville.

### BORAX.

*Lake County*, in large crystals in the clay of the Borax Lake.

### BORACIC ACID.

Clear Lake, *Lake County*.

### CARBONATE OF MAGNESIA.

(See MAGNESITE.)

### CARBONATE OF SODA.

*San Bernardino County*, at Soda Lake, sink of the Mohave River; in *Tulare County*, along the borders of the smaller lakes, when drying up; at the borders of the Santa Anna River, near San Bernardino.

### CASSITERITE.

*San Bernardino County*, at the "Temescal tin region," about sixty miles from Los Angeles. Occurs in many veins associated with schorl (?) traversing granite. In most of the ores the tin oxyd is found only by crushing and washing. At the "Gun lode" a peculiar drab colored oxyd is found in considerable quantities. It appears to be liberated by the decomposition of an arsenical ore, arsenic being abundant in the samples. The oxyd, as collected in that region for examination, is in various degrees of purity, and exhibits different colors. Some of the samples obtained by washing are black, others brown, and some red and drab colored.

*Idaho Territory*, on Jordan Creek, in placers, in beautiful rounded masses, from one eighth to half an inch in diameter, very pure and clean—the variety known as wood tin.—(Cabinet of the author, specimens received from Charles T. Blake, Esq., of Idaho City.)

*Mexico*—*State of Durango*; wood tin of great purity and beauty occurs abundantly in this State. It closely resemble the stream tin of Idaho.

### CERUSITE—(Carbonate of Lead.)

In large crystals resembling those from Siberia, in the Russ District (?) Great Basin, near the Mojave River; *Arizona*, in heavy incrusting masses upon the galena of the Castle Dome District.

### CHALCEDONY.

Large masses of white chalcedony, delicately veined, and in mamillary sheets, occur in *Monterey County*, near the Panochés. On Walker River, Washoe; and of a fine pink color near Aurora, Esmeralda. In pear shaped nodules in the eruptive rocks between Williamson's Pass and Johnson's River, *Los Angeles County*.

## CHALCOPYRITE—(*Yellow Copper Ore.*)

This is the chief ore of the copper mines of California, as it is likewise of the mines of Cornwall, England. It is therefore found at a great number of localities, along the copper bearing belt which stretches in a nearly unbroken zone from Mariposa County northwesterly to Del Norte County, parallel with and on the western side of the chief gold producing belt of the State.

In *Calaveras County* the chief localities (for the massive ore) are: The Union, Keystone, Empire, Napoleon, Campo Seco, and Lancha Plana Mines. In good crystals implanted on and among clear quartz crystals, at the Noble copper claim on Domingo Creek.—(Collection of Dr. Jones, Murphy's.) In *Mariposa County*, the La Victoire Mines, in Hunter's Valley, and Haskell's claims, below Mariposa Town, and claims along the Chowchillas River. *Amador County*, at the Newton Mine. *El Dorado County*, at the Cosumnes Mine, Hope Valley Mine, at the Bunker Hill Mine, El Dorado Excelsior, and other claims at and near Pilot Hill. *Plumas County*, at the Genesee and Cosmopolitan Mines. It occurs also, in small quantities, in *Contra Costa County*, in the rocks of Mount Diablo, and in those of the Coast Mountains, south and north of San Francisco. In *Los Angeles County*, at Richmond District, and at Big Meadow District, both on the interior slope of the mountains at the margin of the Great Basin.—(*Vide Geol. Rec. Cal.*, p. 290.)

*Lower California*, a few leagues south of San Diego, at the Winder claims.

*Arizona*, at the Apache Chief Mine, after getting below the "surface" ores. At the San Pedro Mines, near Fort Buchanan. Near Caborca, in northwestern Sonora.

## CHLORIDE OF SILVER.

At the mines about Austin, *Lander County, Nevada*, this species is abundant in the surface ores, being derived from the decomposition of the mixed sulphurets of silver below the water level. It was also found in the decomposed ores of the upper portions of the Comstock lode, and is common to all the silver veins of the Great Basin. Some remarkably fine specimens were obtained at the ——— mine in Slate Range District, California. Occurs also in the Willow Springs District, and in the veins of El Dorado Cañon, Arizona.

## CHRSOCOLLA—(*Silicate of Copper.*)

Not common in California, where the sulphurets in decomposing give carbonates and oxyds; but in Arizona, along the Colorado River, very common at and near the surface, where the veins containing copper glance are decomposed. Fine specimens were taken from the Great Central claim, about twenty miles from La Paz, and at the Blue lode.

## CHROMIC IRON.

*Monterey County*, in masses, with green crusts and coatings of emerald nickel. *Santa Clara County*, near the North Almaden Mine.



## CHRYSOTILE.

In serpentine, near San Francisco, and at New Almaden, *Santa Clara County*.

CINNABAR—(*Sulphuret of Mercury*.)

This is the characteristic mineral of the Coast Mountains, from Clear Lake on the north to San Luis Obispo on the south. It appears to be connected chiefly with the secondary rocks, though at San Luis Obispo Prof. B. Silliman collected a group of fossils which appear to be miocene tertiary. (See a notice by Mr. Gabb, Proc. Cal. Acad. Nat. Sci.) The principal locality is the well known mine of New Almaden, in *Santa Clara County*, and the adjacent mines of the Enriqueta and the Guadalupe. The ore occurs massive, in large bunches and "strings," and is associated with calc spar, bitumen, and pyrites. The total production of quicksilver, chiefly from the New Almaden, up to January, eighteen hundred and sixty-five, was three hundred and seventy-one thousand eight hundred and eighty-three flasks, valued at about fifteen millions of dollars in gold. At the "North Almaden," on the east side of the San José Valley, and nearly opposite the New Almaden, considerable quantities of cinnabar have been taken out of prospecting pits at this place, at several different points. A heavy ferruginous outcrop shows the general course of the metalliferous belt. The rock is hard and flinty, and is frequently beautifully streaked with brilliant red cinnabar, the whole sufficiently compact to give fine specimens for polishing by the lapidary. It occurs abundantly, and in very handsome cabinet specimens, at the New Idria Mines, in *Monterey County*, at which work has recently been resumed. There are many localities in *Napa County*, and in the vicinity of Clear Lake, and the Geysers. In small crystals in hornstone, at Buckhorn Ranch, north of Berreyesa Valley.

In *Mariposa County*, near Coulterville, in finely colored crystals in quartz in a gold vein. *Nevada County*, about four miles from Grass Valley, washed out of sluice boxes, and entirely different from the New Almaden ore in appearance. *Arizona*, about eighteen miles from the Colorado River; at Olive City, at the "Alma" claim, and the "Eugenie," located by Mr. Ehrenberg; associated with silver. Reported to exist in *Idaho*, on the Owyhee River.

## CORUNDUM.

*Los Angeles County*, in the drift of the San Francisquito Pass, in small crystals.—(Baron Richthofen.)

## COPPER, NATIVE.

This species is common in small quantities in the surface ores of the principal copper mines of the State, but is not found below the permanent water level. No veins of this metal like those of Lake Superior are known upon the Pacific coast, but the abundance of large drifted masses of solid copper in one or more streams upon the northwest coast, (Russ. Poss.,) leave little doubt that such veins do exist in that high latitude. *Calaveras County*—At the Union Mine, some very fine masses of dendritic or moss copper have been taken out, (Cab. of J. B. Meader.) The Keystone Mine, adjoining the Union, also produced some good speci-



mens in eighteen hundred and sixty-one. Found also at the Napoleon and the Lancha Plana Mines; and in *Sacramento County*, at the Cosumnes Mine. In *Santa Barbara County*, occurs disseminated in grains in the midst of serpentine rock. *Arizona*, on the Gila River, about ninety miles from Fort Yuma, at the Arizona Copper Company's mine; associated with red oxide of copper and green carbonate, and spread in crystalline masses through a gangue of calc spar. (Cabinet of the author.) (For the ores of copper, see CHALCOPYRITE, RED COPPER, VITREOUS COPPER, etc.)

### COPPER GLANCE.

*Los Angeles County*, at the Maris Mine, Soledad District, in grains and irregular masses in a syenitic granite. It contains silver. The decomposition of this ore at and near the surface gives metallic copper, and metallic silver, incrusting the surfaces of the granite where fissured. This locality was known and worked as early as eighteen hundred and fifty-three. In *Arizona* this is the most common ore of copper, especially in Weaver District, near La Paz, or Olive City. It is usually argentiferous, and is there associated with gold in quartz veins. Found also in the Cahuabi Valley, the Tajo, and the San Pedro Mines, and near Caborca, in Northwestern Sonora.

### DERBYSHIRE SPAR.

Castle Dome District, *Arizona*. (See FLUOR SPAR.)

### DIAMOND.

*Butte County*, Cherokee Flat, ten miles from Oroville. In well formed, highly modified crystals, from one eighth to three sixteenths of an inch in diameter, and generally of a pale straw yellow color. Crystallization tetrahedral, like fig. 267, p. 24, Dana's System of Mineralogy.

*Idaho*.—Reported to exist on the Owyhee River.

### DIALLOGITE—(Carbonate of Manganese.)

Occurs abundantly in the silver bearing veins about Austin, *Nevada*. By decomposition it becomes black, and discolours the upper parts of the vein, but at and below the water line, with the unchanged ores of silver, it has a delicate flesh red or pink color.

### DOLOMITE.

*Amador County*, in narrow, snow white veins, traversing a talcose chloritic rock, and bearing coarse free gold. (Cabinet of the author, specimen presented by Mr. James.) *Calaveras County*, Angel's Camp, in the Winter, Hill's, and other mines, massive, with the quartz veins, and bears gold. Sometimes in fine crystals, lining cavities. *San Bernardino County*, at the Armagosa Mine, bearing coarse gold.

### EMBOLITE.

Is believed to occur in the surface ores of *Lander County*, *Nevada*, near Austin, and of Washington District, further south, but has not been certainly identified.

## EMERALD NICKEL.

*Monterey County*, with chrome ore.

## FELDSPAR.

*San Diego County*, in crystals. (See ORTHOCLASE.)

## FLUOR SPAR.

In crystals and large cleavable masses, of various tints—white, pink, and purple, and green, like the specimens from Derbyshire, England; in the veins of galena and blende, Castle Dome District, Colorado River, *Arizona*. Sparingly, in small white cubes, with the copper ore, at Mount Diablo.

GALENA—(*Sulphuret of Lead*.)

This common ore of lead has not yet been found in finely crystallized cabinet specimens on the Pacific coast. The localities of the massive or granular ore are numerous—it being found in small quantities in many of the gold bearing veins of the State, especially at the following: *Mari-rosa County*, at Marble Springs Mine; Princeton Mine; Adelaide. *Calaveras County*, at the Barnes and Silver Elephant claims, at Murphy's; at the Star of the West, Blue Mountain District, and the Good Hunter claims, with gold. In *Sacramento County*, at Michigan Bar, with blende and pyrites. *Nevada County*, at Meadow Lake, with blende. *Tuolumne County*, at the Soulsby Mine, with blende and iron pyrites and gold. In *Nevada County*, in several of the veins at Grass Valley, with free gold. In *Tehama County*, on Cow Creek; and abundantly in veins on the Island of Santa Catalina. In *Arizona* it is abundant in the veins of the Castle Dome District, twenty-five miles from Fort Yuma; and in the Eureka District, on the same river, about twenty-five miles further north; also in the Picacho District, and in the Weaver District, near La Paz; at the Santa Rita Mine, with gray copper ore; in the Tajo vein, with copper glance, blende, tetrahedrite, and gold; in the Santa Cruz Mountains, south of Fort Buchanan; at the Mowry and Patagonia Mines; at San Xavier, on the Santa Cruz (Pumpelly.) In *Nevada* it is abundant on Walker's River, north of Esmeralda, and at Steamboat Springs, Galena District. It is also found in portions of the Comstock lode, Washoe, associated with the silver sulphurets; but where it is associated in that vein with much blende and copper pyrites, it is not rich in silver—forming the ore commonly known there as "base metal."

## GARNET.

*El Dorado County*, at Fairmount Mine, three miles from Pilot Hill, in large blocks and masses two feet thick, or more. Associated with specular iron, calc spar, iron pyrites, and copper pyrites, with actinolite in steatite, near Petaluma, *Sonoma County*; in large semi-crystalline masses, weighing ten to twenty pounds, and of a light color, from the Coso mining district. (Specimens of this were brought to San Francisco under the supposition that it was tin ore.) A beautiful green garnet,

grossular, is found with the copper ore of the Rogers claim, Hope Valley, *El Dorado County*, and similarly in copper ore at the Mountain Meadows, *Los Angeles County*. In *Russian America*, Stickeen River, in finely formed trapezohedral and dodecahedral crystals, imbedded in mica slate, and much resembling specimens from Monroe, Connecticut.

#### GOLD—(*Crystalline*.)

*Placer County*, at Irish Creek, three miles from Coloma, in arborescent and crystalline masses covered with octahedrons. (Eighteen hundred and fifty-four, cabinet of author.) At Forest Hill, in the same county, in the placer claims of the Messrs. Deidesheimer, in flattened and distorted octahedra. One crystal is a partially formed octahedron, with a rectangular base, one inch long by seven eighths of an inch wide. At Mameluke Hill, near Georgetown, in ragged crystalline masses, in a quartz vein. In *El Dorado County*, at Spanish Dry Diggings, in large masses of irregular dendritic crystallizations. One mass recently obtained weighed about sixteen pounds, and was purchased by Mr. Dickinson, of New York, for preservation. *Calaveras County*, a large partly formed crystal with octahedral edges; if perfect, would be two inches in diameter. *Tuolumne County*, flattened, distorted, octahedrons, from the Whiskey Hill Mine. *Mariposa County*, octahedrons, from the placers near Coulterville, but very rare. At the Princeton Mine, rarely, in nests and bunches of octahedrons, with brilliant faces.

Small delicate microscopic prisms of gold have been found in the vicinity of Sonora. They appear to be terminated with crystalline planes at both ends, and probably are elongated octahedrons. (From the collection of Dr. Snell.)

Crystals of spongy gold, from one eighth to one quarter of an inch in diameter, and as light, almost, as cork, were washed out by Dr. Hill, from a claim near Angel's. This is a condition of native gold which, it is believed, has not been hitherto noticed.

In *Plumas County*, Sherman Lode, Light Cañon, on coatings of green and blue carbonates of copper, proceeding from the decomposition of variegated copper pyrites or vitreous copper, in part. This gold was apparently deposited *after* the deposition of the carbonate of copper. The specimens are beautiful. (Cabinet of Mr. Waters, Sacramento.) *Mariposa County*, in a narrow vein of calcite, or dolomite, two inches wide, cutting slates; precise locality not known. The gold was in coarse masses and strings, in the middle of the vein. *Amador County*, near Drytown, in a vein of pearl spar, which is very pure and white, and without admixture with quartz or pyrites. The gold is in coarse masses in the midst of the pearl spar. (Specimens collected by Mr. James, and presented to the author.)

Gold in small quantities occurs at many places in the Coast Mountains, and associated with cinnabar. Some specimens of coarse gold have been found in the cinnabar veins of *Colusa County*. In Excelsior District, gold occurs with molybdenite. In *San Bernardino County*, at the Armagosa Mine, in feldspar and in calc spar, in a granitic rock, associated also with arsenolite.

Many large masses of gold have been taken from the placers of California at various times, of which no authentic record or description has been kept. In eighteen hundred and sixty-four, a large mass, one hundred and eighty-seven ounces (fifteen and seven twelfths pounds) was



taken from the Middle Fork of the American River, about two miles from Michigan Bluffs, Placer County.

The Carson Hill quartz claim, in Calaveras County, is celebrated for the size and weight of the masses of gold taken from it, some of which weighed six and seven pounds. (For further observations upon gold, its geology, and distribution, see an article at the end.)

## GOLD AND TELLURIUM.

(See TELLURIUM.)

## GRAY COPPER ORE.

With gold in the Pine Tree Mine, Mariposa Grant, and similarly at the Iona Company's claim, and others upon the same belt near Coulterville. (See TETRAHEDRITE.)

## GRAPHITE.

About twenty miles above the Big Tree Grove, in crystalline scales; also at the mine of the Eureka Plumbago Company, (locality not known.)

## GYP SUM.

*Los Angeles County*, in the Great Basin, near the entrance to the Soledad or "New Pass." *San Diego County*, along the banks of Carizzo Creek, and on the slope of the Desert. *Tulare County*, at the vein of stibnite, in crystals. *Nevada County*, near the Truckee Pass, in beautiful stellar radiations, from one half of an inch to three inches in diameter. (Cabinet of C. W. Smith, Grass Valley.)

## HEMATITE—(*Specular Iron Ore.*)

This is a very abundant ore in California, and Arizona on the Colorado River, near Williams' Fork. Some of the dry arroyos or cañons in that region are crowded with blocks of the pure ore, from one to two feet in diameter. It is broken from beds and seams in an impure metamorphic limestone. The structure is granular, passing into micaceous, and freshly broken surfaces are extremely brilliant. Specimens of similar ore were brought in by Jules Marcou, in eighteen hundred and fifty-three, from the valley of Williams' Fork, further north. This ore occurs also in Humboldt Valley, and abundantly on the coast of Mexico, south of Acapulco.

## HESSITE.

*El Dorado County*, (see TELLURET OF SILVER.)

## HORNBLENDE.

At San Pablo. At Soledad, in syenite. At Vallecito, near Murphy's.

## HYALITE.

Associated with semi-opal, in the Mount Diablo range, about thirty miles south of Mount Diablo. (In cabinet of J. B. Meader, Stockton.)

## IDOCRASE.

Siegel Lode, *El Dorado County*. (?)

## IODIDE OF MERCURY.

*Santa Barbara County*. (?)

## ILMENITE.

*El Dorado County*, near Georgetown, from the gold washings; a very fine crystal, about an inch in diameter, with brilliant planes.

## IRON ORES.

(See MAGNETITE and] HEMATITE.)

## IRIDOSMINE.

With platinum and gold in the beach sands of the northern counties. An analysis by C. A. Kurlbaum, Jr., in Dr. Genth's laboratory, of a sample of the residue from gold washing and amalgamation obtained by the author in eighteen hundred and fifty-four, gave 48.77 per cent of iridosmine. Found also as a residue in melting large lots of placer dust.

## IRON PYRITES.

Found in most of the gold bearing quartz veins, either crystalline or massive; usually from one to five per cent of the whole weight of the ore. The value for gold varies greatly. At Grass Valley the concentrated sulphurets are worth from one hundred dollars to three hundred dollars per ton. Cabinet specimens of this mineral may be had in very large crystals, cubes, at the Fairmount claim, three miles from Pilot Hill, *El Dorado County*. It is there associated with garnets, brown spar, and specular iron. Found in brilliant druses lining fissures in the rocks of the E Pluribus Unum tunnel, three miles from Murphy's, *Calaveras County*. In brilliant, but small cubical crystals, in the gold ore of the Mameluke claim, near Georgetown, *El Dorado County*. *Mariposa County*, in large and perfect crystals, in the slates near the Deville Mine, south of Princeton Hill. *Placer County*, in large crystals, near the Grizzly Bear House, between Auburn and Forest Hill.

## JASPER.

Very fine masses of brown and yellow jasper are abundant near Murphy's, *Calaveras County*, in the quartz veins, and in the debris from them.

## KERARGYRITE.

(See CHLORIDE OF SILVER.)

## LIGNITE.

*San Francisco County*, *Contra Costa County*, *Monterey County*; in *Amador County* in thick beds, at the base of the Sierra Nevada; used in lone

City for steam boilers; *Santa Barbara County*, *Humboldt County*, along the Eel River; *Klamath County*, at Gold Bluff, four hundred feet below the surface. (Lieut. Tuttle, U. S. A.) *Del Norte County*, at Point St. George. (Prof. Sherman Day.) In *Nevada*, *Washoe County*, along the Truckee River; in *Lygon County*, at the "Whitman Mines."

### LIMONITE.

*Mariposa County*, at Burns' Creek, near the old road to Fort Miller, in a heavy outcrop of quartz; solid blocks of limonite, from two to four feet thick, are found there. (See Geol. Rec. Cal., p. 290.) *Oregon*, sixteen miles from Portland, in an extensive bed; specimens were sent by Governor Gibbs to the Mechanics' Fair exhibition in eighteen hundred and sixty-four.

### MACLE.

*Mariposa County*: (See ANDALUSITE.)

### MAGNESITE—(*Carbonate of Magnesia*.)

*Tulare County*, near Visalia, between Four Creeks and Moore's Creek, in the foothills, in solid beds of pure white, massive carbonate of magnesia, hard, fine-grained, and like unglazed porcelain in texture. The beds are from one to six feet thick, and are interstratified with talcose slates and serpentine. Similar beds are described to me as existing in the Diablo range, *Alameda County*, about thirty miles south of the mountain. *Mariposa County* and *Tuolumne County*; a heavy bed of magnesian rock, chiefly magnesite, charged with crystals of iron pyrites, accompanies the chief gold bearing quartz vein of these counties. This rock is charged also with nickel and chrome tale in green films, like the magnesite of Canada.

### MAGNETITE.

In large beds, massive, and of superior quality, in *Sierra County*; also in octahedral crystals, forming beautiful cabinet specimens. In *Plumas County*, near the line, fine groups of octahedrons associated with garnet (?) and epidote. (?) *Mariposa County*, just east of the Mariposa Estate, on the trail to Yosemite. *Placer County*, at Utt's Ranch, six miles from Auburn. At the Cañada de las Uvas. *Los Angeles County*, in a vein about three feet thick, in limestone; in the syenitic granite of the mountains between the Great Basin and Los Angeles; seen in drift fragments in the Valley of Soledad, or "Williamson's Pass." *El Dorado County*, at Volcanoville, on the Middle Fork of the American River, near the great quartz vein. This locality was noted by the writer in eighteen hundred and fifty-three. This ore is, perhaps, titaniferous, but specimens are not at hand for examination. *Trinity County*, near Weaverville, in small veins. (Trask, 3d Report, 1865, p. 56.) *Nevada County*, three miles from Grass Valley. *El Dorado County*, fine octahedral crystals, in slate, near the Boston Copper Mine; in small brilliant crystals, with quartz, pyrites, and calc spar, at the El Dorado Excelsior Copper Claim.

### MALACHITE—(*Green carbonate of copper*.)

In remarkably fine specimens, associated with crystalline blue carbonate, at Hughes' Mine, *Calaveras County*, (1861.)



## MANGANESE, OXYD.

(See PYROLUSITE.)

## MANGANESE, CARBONATE OF.

(See DIALLOGITE.)

## MERCURY.

Native quicksilver is found in *Napa (?) County*, near the Geysers, at the Pioneer Claim, in a silicious rock.

(For sulphuret of mercury, see CINNABAR.)

## MERCURY, IODIDE OF.

*Santa Barbara County*, (Mr. G. E. Moore.)

## MISPICKEL.

Grass Valley, *Nevada County*, at the Betsey Mine, with gold. This mineral is a common associate of gold in the quartz veins of the State. Crystals of mispickel are sometimes penetrated with gold.

## MOLYBDATE OF LEAD.

*State of Nevada*, Comstock lode, in the upper part of the California Mine, in the "rusty lode," in small yellow crystals; in good crystals in the —— (?) Mine, Weaver District, *Arizona*.

## MOLYBDENITE.

Occurs in fine specimens at several localities in the gold region; *Nevada County*, at the Excelsior Mine, Excelsior District, abundantly with gold.

## MOUNTAIN CORK.

*Tuolumne County*.

## NICKEL.

(See EMERALD NICKEL.)

## ORTHOCLASE.

*San Diego County*, in granitic veins along the road between Santa Isabel and San Pasquale, associated with tourmalines and garnet. *Fresno County*, at Fort Miller, in coarse grained granite, under the edge of the lava plateau.

## OPAL—SEMI OPAL.

A white milky variety of opal is found in *Calaveras County*, at Mokelumne Hill, or on the hill near that place, known as Stockton Hill, on the west side of Chile Gulch. A shaft has been sunk there three hundred and forty-five feet, and the opals are found in a thin stratum of red gravel.

They vary in size from a kernel of corn to the size of walnuts. Many of them contain dendritic infiltrations of manganese oxyd, looking like moss. About a bushel of these stones are raised in one day, and are said to have a market value. A white milky variety, similar to the above, and without "fire," is found with magnesite in Mount Diablo Range, thirty miles south of the mountain. Also in the foothills of the Sierra Nevada, at the Four Creeks.

#### PEARL SPAR.

(SEE DOLOMITE.)

#### PETROLEUM.

Abundantly distributed throughout the coast counties from San Diego in the south to Crescent City in the north. The purest and most limpid natural oils have thus far been obtained from the localities north of San Francisco, in *Humboldt* and *Colusa Counties*. These oils are green by reflected light, and resemble the best samples from Pennsylvania. No abundantly flowing wells have yet been found. In *Humboldt County* there are many springs, giving both oil and gas, and numerous wells are in progress. So also in *Colusa County*, at Bear Valley, about twenty-five miles west of Colusa, several springs, giving a fine quality of lubricating oil and much gas. Also at Antelope District, nineteen miles west of Colusa. In *Contra Costa County*, ten miles from Oakland, there are petroleum springs, and a very superior oil has been obtained from the region of Mount Diablo. In *Tulare County* there is an extensive region where oil and gas springs abound. The localities are numerous in the Counties of *San Luis Obispo*, *Santa Barbara*, *Tulare* and *Los Angeles*.

#### PLATINA.

With iridium and iridosmine, on the coast at Cape Blanco, Southern Oregon. Analysis of a sample of the mixed metals from Port Orford, in eighteen hundred and fifty-four, gave forty-three and fifty-four one-hundredths per cent of platina.

#### PROUSTITE.—(*Light Red Silver Ore.*)

In the veins about Austin, *Lander County, Nevada*. At the Daney Mine, and occasionally in the ore of the Comstock lode.

#### PYRARGYRITE.—(*Dark Red Silver Ore.*)

(SEE RUBY SILVER.)

#### PYROLUSITE.

Red Island, Bay of San Francisco, in vein or bed 3' to 4' wide, in the metamorphic jaspery shales—the "prasoid" rocks. This is a remarkably pure ore of manganese, and has been extensively mined for shipment.

#### PYROPHYLLITE.

Occurs in the gold region; locality not known.

## PYROXENE.

In fine crystals, dark green, near Mud Springs, *El Dorado County*]

PYROMORPHITE—(*Phosphate of Lead.*)

In *Nevada*, in the outcrops of the Comstock lode, especially the back ledges of the Ophir ground, giving green coats and crusts on the surface of the quartz.

PYRRHOTINE—(*Magnetic Pyrites.*)

*Mariposa County*, at the Iona Copper Company's tunnel, north side of the Merced River, on the trail from Bear Valley to Coulterville.

## QUARTZ.

This abundant mineral is obtained in fine crystals in the quartz veins in various parts of the State, and in the mines of Washoe. Some large and well formed crystals, from three to four inches or more in diameter, have been found at Red Hill, in *Placer County*, (cabinet of C. W. Smith, Grass Valley.) and in the placer claims in the vicinity of Placerville, where also a fine large crystal of smoky quartz was found. *Mariposa County*, on Whitlock's and Shirlock's Creeks, in the quartz veins, in fine groups of crystals; also at the Mariposa Mine, and in the eastern parts of the Princeton vein. *Calaveras County*, at the Noble claim, on Domingo Creek. *Nevada County*, in the Grass Valley mines, often supporting gold between the crystals, and at the "French lode," (Eureka?) crystals of a light greenish tinge, like that of datholite.

## RED OXYD OF COPPER.

Occurs sparingly in thin crusts and sheets with the surface ores of the principal copper mines in *Calaveras County*, especially the Union and the Keystone. In *Mariposa County*, at La Victoire Mine, with green and blue carbonates of copper. *Del Norte County*, at the Evoca, Alta, and other mines, in very good cabinet specimens, the cavities being lined with crystals. In *Plumas County*, and in the upper parts of most of the copper veins of the State. *Arizona*, at the Arizona Copper Mining Company's claim, near the Gila River, in large masses, with native copper and thin crusts of green carbonate. At the claim known as No. 15, Yavapai District, with native copper.

RUBY SILVER—(*Pyrrargyrite.*)

This beautiful ore of silver was first observed in the Dancy Mine, Washoe, by the writer, in eighteen hundred and sixty-one, and has since been found sparingly in the Ophir and the Gould and Curry. In the latter mine some very fine specimens were obtained by Mr. Strong, and are deposited in the cabinet of the company, at the office in Virginia City. This ore is abundant in the veins about Austin, Reese River, and is often so thoroughly spread through the quartz of the gangue as to give it a decided reddish color. It is generally associated with sulphuret of silver. No good crystals have yet been found.



## SALT—ROCK SALT.

Abundant in the dry season, as an incrustation, throughout California. Found in large quantities in Nevada, in the beds of dessicated lakes at numerous places. About twelve miles north of Armagosa Mine, in large masses. In the Wasatch Mountains, southeast of Lake Timpanogos, on the headwaters of a small creek tributary to Utah Lake, in thick strata of red clay. (Fremont's Geog. Mem., 67.) This is said to be the same locality mentioned by Father Escalante, in his journal, and noted by Humboldt on his map as "*Montagnes de Sel Gemme*." Salt crystallizes from the spray of the waters of the Great Salt Lake, and is found abundantly on its shores, and on twigs and shrubs. The Great Salt Lake is a saturated solution of common salt. The shores in the dry season are incrustated with salt, and shallow arms of the lake present beds of salt for miles. Plants and shrubs are incrustated to a thickness of an inch or more with crystallized salt deposited by the spray. Five gallons of the water taken in the month of September, and evaporated by Colonel Fremont over a fire, gave fourteen pints of salt, which analysis showed to have the following proportions (*Fremont's Memoir*, 9):

Chloride of sodium .....	97.80
Chloride of calcium.....	0.61
Chloride of magnesium.....	0.24
Sulphate of soda.....	0.23
Sulphate of lime.....	1.12
	<hr/>
	100.00

## SCHORL.

(See TOURMALINE.)

## SELENITE.

In beautiful stellar crystallizations on the crossing of the Little Truckee, Henness Pass road. The blades composing these aggregates are from half an inch to two inches in length, and from one eighth to one quarter of an inch in width. They are perfectly clear, and most of them hemitroped so as to form arrow-headed crystals. (Cabinet of C. W. Smith.)

## SELENID OF MERCURY.

In large masses from the vicinity of Clear Lake.

## SILVER—NATIVE.

This metal, in its native state, is rare in the State of California. At Silver Mountain District, (formerly *El Dorado County*,) it occurs in the decomposed surface ores. *Los Angeles County*, in the decomposed parts of the Maris vein, Soledad, covering surfaces of syenite. *Sonora*, at the celebrated *Planchas de la Plata*, just south of the Arizona line, and near the meridian of Tubac. According to the best Mexican and Jesuit authorities, large masses of native silver were discovered there in seventeen hundred and sixty-nine. One mass is reported to have weighed three thousand six hundred pounds. No vein has been found; the depo-

sit is a placer. (Pumpelly.) *Nevada*—*Storey County*, in the Comstock lode, in filaments, and matted, hairy masses—"wire silver," usually closely associated with silver glance and stephanite. At the Burning Moscow claim, (Ophir,) some large masses of ore were taken out in eighteen hundred and sixty-four, completely charged with the metal. Occurs also at the Dancy Mine with native gold and sulphuret of silver. *Lander County*, in the veins about Austin, associated with the surface ores, such as the chloride and bromide of silver, and green and blue carbonates of copper. *Idaho Territory*, in large masses at the "Poor Man's lode," or "Candle-box Mine," where it was said the lumps of silver were as large as candle boxes. That a great quantity of large masses of the metal was taken out there is no doubt. It is common in the silver lodes of the Owyhee, and is usually very filamentous and finely divided and imbedded in granular quartz.

#### SILVER—(*Telluret of*.)

A single specimen was obtained by the author in eighteen hundred and fifty-four, near Georgetown, in *El Dorado County*. It had been washed out from the gold drift, and the parent vein has never been found.—(*Rep. Geol. Rec. Cal.*, 302.)

#### SMOKY QUARTZ.

A large crystal about six inches in diameter, from *Placer County*, and in the cabinet of Dr. White, Placerville.

#### SPIIENE.

In small hair-brown crystals in the granite of the Sierra Nevada.

#### STEPHANITE—(*Brittle Sulphuret of Silver*.)

Very fine crystals of stephanite were obtained from the Ophir and Mexican Mines, *Nevada*, soon after they were opened. These crystals were from half an inch to two inches in length, but were generally imperfectly formed. They greatly resemble the crystallizations of vitreous copper from the Bristol Mine in Connecticut. A large collection of these was made by R. L. Ogden in eighteen hundred and fifty-nine and sixty, and were noticed by the writer in the Mining Magazine. They are now more rare, but have been found in nearly all the principal claims upon the Comstock lode. Some very good specimens were taken from the Gould and Curry, and preserved in the cabinet by C. L. Strong in eighteen hundred and sixty-four. They are frequently implanted among quartz crystals in nests or geodes, and are covered with a hairy growth of wire silver.

Crystals of silver ore from Silver Mountain District are probably this species.

#### STIBNITE.

*Tulare County*, in a large vein near the Pass of San Amédo. (Vide *Rep. Geol. Rec. Cal.*, pp. 292-3.) It occurs in large, solid masses, boulders of which are numerous in the beds of the arroyos leading from the vein. In *Nevada*, at or near the Gem Mine, Dungen; at the Sheba Mine, in beautiful needle like crystals; and at the De Soto and other mines in that vicinity; in Russ District, Great Basin.

## STROYMEYERITE.

*Arizona*, Heintzleman Mine.

## SULPHUR.

*Colusa County*; *Napa County*, at the Geysers. In *Nevada*, in extinct solfataras, Humboldt Valley.

## SULPHURET OF SILVER.

*Nevada*, Comstock lode; occurs with stephanite in the Ophir, Mexican, Gould and Curry, and other mines upon that line of claims. It is also present in the ore of the vein at Gold Hill, and appears to be the chief source of the silver in those ores. It has not been observed in crystals. In the large chamber of the Ophir Mine, in eighteen hundred and sixty-one, it was very abundant, in irregular masses ramifying through the fragmentary white quartz so as to hold it together in hand specimens. Large masses of vein-stuff could be broken down, in which the sulphuret of silver constituted at least half of the whole weight. Native gold was commonly associated with it in that part of the mine. It is now more frequently found associated with copper pyrites and galena. This species is also found in small crystals in the ore of the Dancy Mine, associated with native silver, gold, and ruby silver. It is common in the ores of Reese River, associated with ruby silver and manganese spar. It is probably the chief ore of silver in the Cortez District.

## SULPHURET OF IRON.

(See IRON PYRITES.)

## TELLURET OF SILVER.

(See SILVER.)

*El Dorado County*.

TETRAHEDRITE—(*Gray Copper*.)

*Mariposa County*, with the gold in the Pine Tree vein; also with the gold in the same or similar vein at the Crown lode, Emily Peak, and at Coulterville in several claims. *Calaveras County*, at Carson Hill, in the large vein, and associated with gold. This ore in decomposing leaves a blue stain of carbonate in the quartz, and where it is found the rock is generally rich in gold. In *Nevada* it occurs abundantly in the Sheba Mine, *Humboldt County*, massive and rich in silver. It is associated with the following species, which were noted from time to time by Mr. Moss, the Superintendent, and in part by the author: Ruby silver, argentiferous galena, antimonial galena, iron pyrites, blende, cerusite, calcite, quartz with acicular antimony, sulphuret of antimony in delicate needles and massive, native silver, bournonite. Found also in *Lander County*, with the silver ores of the veins near Austin; at the Comet lode, Veatch Cañon, south of Austin. *Los Angeles County*—At the Zapata claim, San Gabriel Mountains. *Arizona*—At the Heintzleman Mine, containing from one to one and a half per cent of silver. (Pumpelly.) Also at the Santa Rita Mine, associated with galena.



TELLURIUM AND GOLD—(*Tetradymite?*)

At the Melones and Stanislaus Mines, one mile south of Carson Hill, *Calaveras County*. Very beautiful specimens of native gold associated with tellurium were taken out of a vein from six to eighteen inches thick, and at a depth of two hundred feet from the surface. This telluret has a tin white color, and is not foliated like the tetradymite from the Field vein in Georgia. Its exact specific character is not yet determined.

TIN ORE—(*Oxyd of Tin.*)

(See CASSITERITE.)

## TOPAZ.

In clear, colorless crystals, finely terminated, from one eighth of an inch to half an inch in diameter, found in the tin washings of Durango, Mexico. (Cabinet of the author, eighteen hundred and sixty-four.) Noticed by C. F. Chandler, *American Journal of Science*, eighteen hundred and sixty-five.

## TOURMALINE.

*San Diego County*, north side of the Valley of San Felipe, in feldspathic veins, (for description and figure see Rep. Geol. Rec. Cal., Blake, p. 304;) *Tuolumne County*.

## TREMOLITE.

White and fibrous in limestone, Columbia, *Tuolumne County*.

## TUNGSTATE OF MANGANESE,

With tungstate of lime, in the Mammoth Mining District, *Nevada*. (C. T. Jackson, Proc. Cal. Acad. iii, 199.)

VARIEGATED COPPER ORE—(*"Horseflesh ore."*)

Sigel lode, in *Plumas County*.

## VITREOUS COPPER.

(See COPPER GLANCE.)

## ZINC.

(See BLENDE.)

PRINCIPAL PUBLIC AND PRIVATE  
MINERALOGICAL AND GEOLOGICAL COLLECTIONS  
IN CALIFORNIA,

KNOWN TO THE AUTHOR.

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I.—PUBLIC COLLECTIONS.

STATE GEOLOGICAL COLLECTION—Sacramento and San Francisco; not arranged, and in part destroyed by fire in eighteen hundred and sixty-five, at the Pacific Warehouse.

STATE AGRICULTURAL SOCIETY'S—At Sacramento; partly in cases, but not classified or arranged.

SAN JOAQUIN AGRICULTURAL SOCIETY—At Stockton; collected chiefly by Dr. Holden; not large, nor well arranged.

CALIFORNIA ACADEMY OF NATURAL SCIENCES—At San Francisco; not arranged; in boxes, and stored, awaiting a suitable room or building for their display. This collection was made in great part by and through the exertions of Dr. J. G. Trask, and has many valuable specimens taken from our mines soon after their discovery.

COLLEGE OF CALIFORNIA—At Oakland. A collection of minerals and fossils of California; partly arranged.

SANTA CLARA COLLEGE—(No particulars known.)

ODD FELLOWS' LIBRARY ASSOCIATION—At San Francisco. A valuable miscellaneous collection of minerals, ores, fossils, and curiosities, chiefly the donation of the members of the Order; arranged in cases, at the Hall. The Order is indebted, chiefly, for this valuable addition to their rooms to the zeal and enthusiasm of their President, S. H. Parker, Esq.

OCCIDENTAL HOTEL—Lewis Leland, San Francisco. A collection containing many very choice and valuable specimens of ores and precious metals of the Pacific coast.

## II.—PRIVATE COLLECTIONS.

W. P. BLAKE—At San Francisco and Oakland. A collection of minerals, ores, geological specimens, and fossils, from California, Nevada, Arizona, Idaho, Mexico, the Eastern States, Japan, and China, with some European minerals. About sixty boxes of this collection were destroyed in the Pacific Warehouse, by fire, in eighteen hundred and sixty-five. A portion, stored at the College and elsewhere, was uninjured. It is now partly in boxes, and partly in cases, in San Francisco, and at the College of California, Oakland. There are probably five thousand to six thousand specimens, a great part of them selected by the owner at the localities. It contains a valuable and extensive suite of crystalline gold.

Dr. J. M. FREY—Sacramento. A large and valuable miscellaneous collection of Pacific coast minerals, including a fine suite of gold in crystals. Arranged in part, in cases, in Sacramento.

Dr. JOHN HEWSTON, Jr.—San Francisco. Miscellaneous collection.

Dr. JONES—Murphy's, Calaveras County. A miscellaneous collection, chiefly local.

A. P. MOLITOR—San Francisco. Miscellaneous collection.

R. L. OGDEN—San Francisco. A miscellaneous collection of copper and gold ores. A large collection made by this gentleman up to eighteen hundred and sixty-one, was purchased by W. P. Blake, in eighteen hundred and sixty-one.

AUGUSTE RÉMOND—San Francisco. (No particulars known.)

Dr. SNELL—Sonora, Tuolumne County. A rich and valuable collection of fossils and aboriginal relics from the auriferous gravel under Table Mountain, and of minerals and ores from that region. This is the richest collection of relics of the mastodon and the mammoth in California.

T. J. SPEAR—San Francisco; formerly at Georgetown, in eighteen hundred and sixty-two and three. A small miscellaneous collection, which included an *ammonite*, from the gold slates of the American River; valuable to science as one of the evidences of the secondary age of the gold bearing rocks of California.

Dr. STOUT—San Francisco. A miscellaneous collection of Eastern and European specimens, arranged in cases.

C. W. SMITH—Grass Valley, Nevada County. An interesting collection, arranged in cases, and containing some choice specimens from the mines of Grass Valley.

Dr. WHITE—Placerville, El Dorado County. A miscellaneous collection, containing many interesting specimens from that region, and some foreign minerals, by exchange.

W. R. WATERS—Sacramento. Miscellaneous collection of minerals and ores, arranged in case.



## Notes on the Geographical Distribution and Geology

OF THE

# PRECIOUS METALS AND VALUABLE MINERALS

ON THE

PACIFIC SLOPE OF THE UNITED STATES.

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If we attempt to delineate by colors upon a map the geographical distribution of the gold, silver, copper, and quicksilver localities of the Pacific slope, we obtain a series of nearly parallel belts or zones, following the general course or trend of the mountain chains and of the coast. So, also, if we enter the Golden Gate and travel eastward across the country to the Rocky Mountains, we pass successively through zones or belts of country characterized mineralogically by different metals and minerals.

In the Coast Mountains, for example, quicksilver is the chief, and the highly characteristic economical mineral. The localities of its ore are strung along the mountains through the counties north and south of the Golden Gate. We have also petroleum, sulphur, and calcareous springs, nearly coincident in their distribution. Passing from this grouping of minerals eastward over the coal beds of Mount Diablo, and crossing the great interior valley of California, (probably underlaid by lignite,) we rise upon the slope of the Sierra Nevada, and reach the copper producing rocks. These form a well marked zone, which has been traced almost uninterruptedly from Mariposa to Oregon, following the lower hills of the Sierra Nevada.

East of the copper belt, (and in the central counties, over a chain of hills known as "Bear Mountains,") we find the great gold bearing zone, characterized by lines of quartz ledges, following the mountains in their general northwesterly and southeasterly course. This gold belt is composite in its character—the veins traversing either slates, limestones, sandstones, or granite.

Crossing the snow-covered crest of the Sierra, where in some parts iron ores have been found, we leave the region of gold and enter that of silver mingled with gold, extending up and down the interior eastern

slope of the Sierra throughout California, into Arizona and Mexico on the south, and Idaho on the north.

At the Reese River Mountains, further east, towards Salt Lake, the gold is replaced by silver, associated with copper, antimony, and arsenic; and this grouping is in its turn replaced by the gold bearing sulphurets of the Rocky Mountains. This is the *general* distribution of the precious metals. There are, doubtless, local exceptions.

It is evident that this distribution of the metals and minerals in zones has been determined by the nature of the rocky strata, and by their condition of metamorphism. It is worthy of note that the minerals of the coast ranges are chiefly the more volatile and soluble, such as cinna-bar, sulphur, petroleum, and borax, distributed in rocks ranging from the tertiary to the cretaceous, inclusive.

The longitudinal extension of the gold bearing zone is yet undetermined. The metal has been traced through the whole length of California, through Oregon and Washington into British Columbia, and beyond, along the Russian possessions, towards the Arctic Sea. Southward, it is prolonged into Sonora and Mexico, and there is every reason to believe that its extension is coincident with the great mountain chain of North America in its course around the globe, into and through Asia.

After years of laborious search for fossils by which the age of the gold bearing rocks might be determined, I had the pleasure early in eighteen hundred and sixty-three, to obtain a specimen containing *Ammonites* from a locality on the American River, preserved in the cabinet of Mr. Spear. This fossil was of extreme importance, being indicative of the secondary age of the gold bearing slates, and was therefore photographed, and copies of it sent to the Smithsonian Institution at Washington, for description. It was subsequently noticed in the proceedings of the California Academy of Natural Sciences, September, eighteen hundred and sixty-four. The same year, when at Bear Valley, Mariposa County, upon the chief gold bearing rocks of California, I identified a group of secondary fossils from the slates contiguous to the Pine Tree Vein, and noticed them at a meeting of the California Academy, October third, eighteen hundred and sixty-four, announcing the jurassic or cretaceous age of these slates. The best characterized fossil was a *Plagiostoma*, (or *Lima*), to which I provisionally attached the name *Erringtoni*.\* The attention of the geological survey having been directed to this locality by my announcement and exhibition of the fossils in San Francisco and at the Academy, Mr. Gabb, the Paleontologist of the Survey, visited the locality and obtained specimens. These fossils were of such interest and importance to science, and to the geological description of the State, that an extra plate was engraved for them and published in the appendix to the volume on the Geology, recently issued.†

Fossils of secondary age from Genessee Valley, in the northern part of the State, were common in collections in eighteen hundred and sixty-four, and are described by the State Geological Survey, volume one, paleontology. It appears also, from the same source, that Mr. King, a gentleman connected with the survey, had obtained *pelemnites* from the Mari-

\* In honor of Miss Errington, a lady residing on the estate, and who drew my attention to some impressions on the slates which she had picked up on the English trail, which proved to be fossils.

† I regret to observe, that in this publication, as well as in Mr. Gabb's notice of the fossils, no mention is made of my previous announcement, and that my part in the discovery and publication of the secondary age of the Mariposas gold rocks, is studiously and wholly ignored.

posas rocks in eighteen hundred and sixty-four, but no figures or descriptions are given.

We may thus regard the secondary age of a part, at least, of the gold bearing rocks of the Sierra Nevada as established, a result of no small importance practically, for it destroys the dogma, which has been very generally accepted, that the Silurian or Palaeozoic rocks are the repositories of the gold of the globe. We may now look for gold in regions where, before, it was generally presumed to be absent, because the formations were not Silurian or Palaeozoic.

The Silurian age of the gold rocks of California has not always been assumed. It has been repeatedly questioned. In the preface to the writer's "Report of a Geological Reconnaissance in California" it is stated that a considerable part of the gold bearing slates of California are probably carboniferous. The absence of all evidence of Silurian fossils west of the Rocky Mountains is also distinctly noted—(p. 276.) The opinion of the comparatively modern age of the gold rocks has been steadily gaining strength and support for years past, and has been the subject of discussion in the daily journals.

The prevalence of gold in the Coast Mountains, in or in close proximity to rocks of *tertiary* age, leads us to question whether it may not occur in the rocks of this late period also. The fact, recently ascertained, that gold is very generally associated with cinnabar, makes it more than probable that the metal has been deposited in formations as recent even as the Miocene, (or middle tertiary,) for, according to the best evidence we now have, this is the age of a part, at least, of the quicksilver bearing rocks.

Such a result need not surprise us, although so far in opposition to generally existing views of the geological association of gold. The geological age of the rocks has manifestly nothing to do with the deposition of gold; it is only necessary that the rocks should have a favorable mineral composition and a suitable degree of metamorphism. On this general view, we may be prepared to find gold in rocks of any geological period, from the tertiary to the Laurentian or Huronian rocks, inclusive.

The lithology of the chief gold bearing zone or belt of rocks of California is interesting. The chief or "Mother Vein" extends through several counties, with occasional breaks or interruptions; and throughout its course preserves its distinguishing characters. It follows also the same geological horizon, or zone, keeping between well marked geological and geographical boundaries, so that a description of the strata adjoining it at one place will serve to give a general view of them throughout. A cross section in considerable detail was made on the Mariposa estate in eighteen hundred and sixty-four. This estate includes the southern end of the "Great Vein"—there known as the "Pine Tree." It also includes several veins lying west of the line of the Pine Tree, of which the most important is the "Princeton," noted for its richness and large production of gold. This group of veins follows a long valley between two high ridges—Bear Mountain on the west, and Mount Bullion on the east. Those ridges are formed of hard rocks; the rocks of the valley are argillaceous and sandy slates and sandstones. The stratification of these slates is remarkably regular and distinct—their thin outcrops standing sharply out at intervals in long lines in the ravines and on the hillsides, mark their trend, and show that they are nearly vertical, or have a slight inclination northeast or easterly. The general direction of



the outcrops and of the valley is northwest and southeast; but there are several local variations.

These slates are generally light colored or drab at the surface; but in depth they are black, like roofing slate, and break up into rhomboids. This is particularly well shown at the Princeton Vein. There are numerous intercalations of sandy layers passing into sandstones—sometimes into coarse grits, and even pebbly beds, and beds of slaty conglomerate. The softer and most finely laminated portion of the group is generally found near the medial line of the valley, and is the point at which the Princeton Vein occurs. It is near this part of the series, at the northern end of the estate, that the jurassic fossils occur.

The following is an approximate geological section of the estate, at right angles to the course of the rocks, and nearly over the Princeton Vein. It is a composite section, being made up of three distinct portions where the observations had extended, but all near together, so as to present a fair view of the sequence of the formations. The whole embraces a distance of about four miles, according to the scale of the small published map of the estate. The southwestern end is taken along Bear Creek, the middle portion across the Princeton Vein, and the remainder on a line near Upper Agua Fria, northeasterly to Bullion Ridge. The following is the sequence of formations from west to east:

#### SECTION ACROSS THE MARIPOSAS.

1. Coarse, heavy conglomerates, metamorphosed—Bear Mountains.
2. Compact crystalline slates; crystalline cleavage.
3. Conglomerate; slaty.
4. Argillaceous slates, regularly stratified; thick series.
5. Sandstone and sandy beds, (thin.)
6. Princeton gold vein; quartz three feet thick.
7. Argillaceous slates and quartz veins; the horizon of the jurassic fossils.
8. Magnesian rock and quartz veins.
9. Pine Tree or "Mother Vein," or its extension.
10. Argillaceous slates.
11. Conglomerate; slaty.
12. Compact slates.
13. Greenstone, limited in extent; probably a metamorphosed sandstone.
14. Sandstones and sandy slates.
15. Serpentine and magnesian rocks—the northern extension of Buckeye Ridge.
16. Compact slates, crystalline and much metamorphosed.
17. Conglomerates and sandstones, heavy and massive; the so-called "greenstone" of Mount Bullion Range.

This is the general outline of the formations. Both of the bounding ranges of the valley are formed by the heavy metamorphic conglomerates, so much altered and changed as to be scarcely recognizable. They are generally supposed to be formed of greenstone, and in some places they do not give any evidence of their sedimentary origin; in others, the outlines of the pebbles and boulders are distinct. These boulders are remarkably large and heavy. From the general similarity of the rocks of these two ranges—Bear Mountain on the west and Bullion Range on the east—together with the succession and character of the formations between, I am led to regard the whole series as a fold or plication, and the valley as either synclinal or anticlinal—probably the former.\*

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\*The above section of the gold formation of the estate, and the substance of the observations upon it, were given in a report to F. L. Olmsted, Esq., in eighteen hundred and sixty-four. Inedited.

Bear Mountain Range is prolonged far to the north into Calaveras County, and there proves the separation between the Valley of Copperopolis, traversed by the Reed or Union copper lode, and the gold quartz region of Angel's Camp and Carson Hill. The whole belt of formations from Amador County, northeastward, through Calaveras, Tuolumne, and Mariposa Counties, is an interesting field for a geologist to work up, to show not only the geographical extent of the rocks and the veins, but the structure or folding of the whole. The two lines of hard conglomerate forming the high ridges, are distinct for nearly the whole distance. The serpentine rocks which accompany the gold formation are probably the result of local metamorphic action, for they often occur in lenticular or elipsoidal patches in the other rocks. So also the greenstone, in places, appears to be an altered portion of rocks, which at other points are distinctly sedimentary, and exhibit slaty stratification.

## ERRATA.

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Page 5, *for Reconnoissance, read Reconnaissance.*

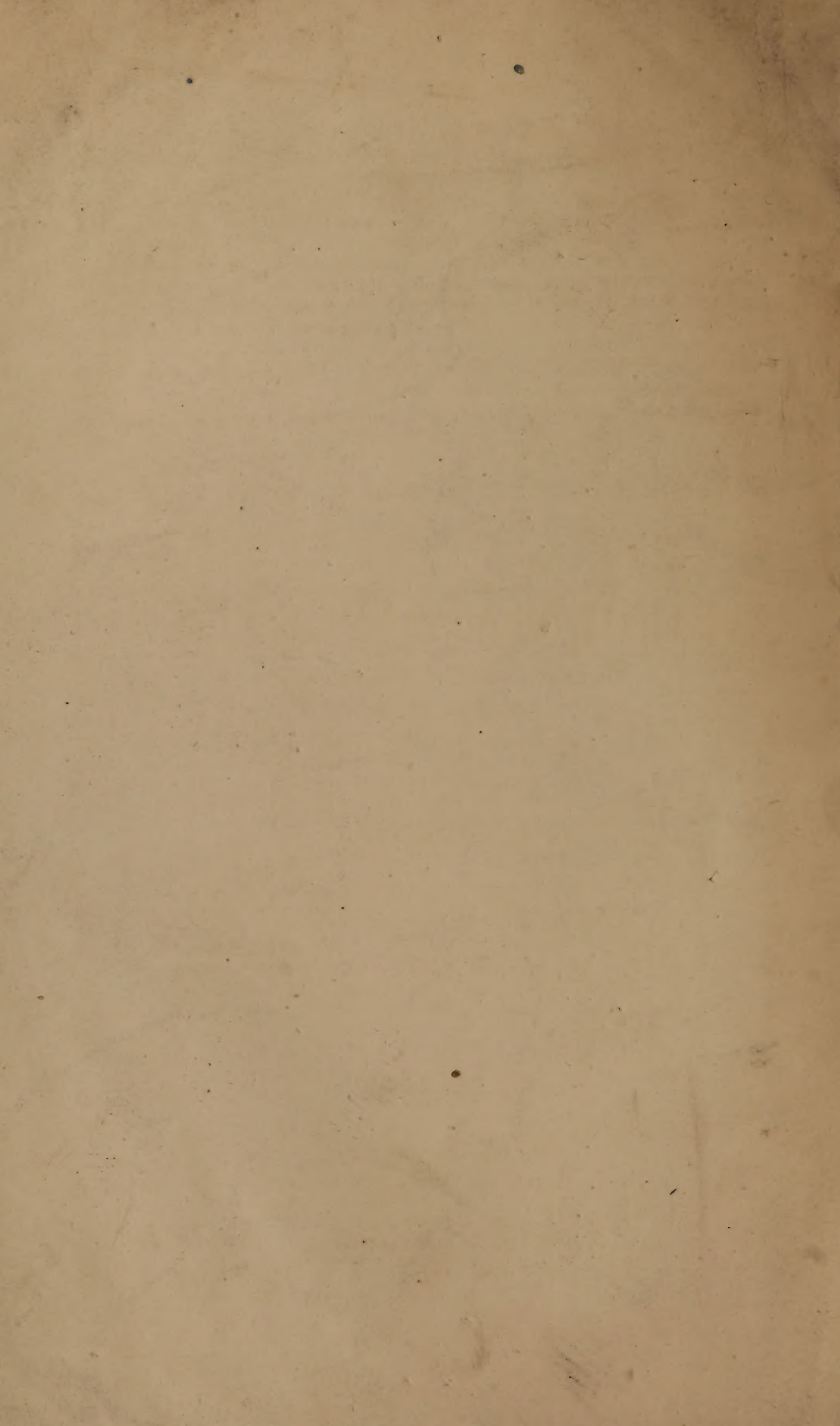
Page 20, *for Pgrargyrite, read Pyrargyrite.*

Page 28, *last line, for pelemnites, read belemnites.*

Page 31, *second line, for proves, read forms.*







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CALIFORNIA MINERALS.

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BLAKE.



